WHAT IS CLAIMED IS:

1. Titanium dioxide fine particles, wherein at least two members selected from carbon, hydrogen, nitrogen and sulfur are doped in titanium dioxide.

2. Titanium dioxide fine particles, wherein nitrogen and at least one member selected from carbon, hydrogen and sulfur are doped in titanium dioxide.

3. Titanium dioxide fine particles, wherein carbon, hydrogen and nitrogen are doped in titanium dioxide.

4. Titanium dioxide fine particles according to any one of Claims 1 to 3, wherein the concentration of doped nitrogen is 700 ppm by weight or more and 10,000 ppm by weight or less.

5. Titanium dioxide fine particles according to any one of Claims 1 to 3, wherein doped nitrogen is bonded to titanium of titanium dioxide as Ti-N-O bonds or Ti-N-Ti bonds.

6. Titanium dioxide fine particles according to Claim 5, wherein the Ti-N-Ti bonds are the majority of the nitrogen-titanium bonds.

7. Titanium dioxide fine particles according to any one of Claims 1 to 3, wherein doped nitrogen is desorbed as N_2 by heating the titanium dioxide fine particles to show an N_2 desorption peak at a temperature of 700°C or more.

8. Titanium dioxide fine particles according to any one of Claims

1 to 3, wherein doped hydrogen is desorbed as H_2 by heating the titanium dioxide fine particles to show an H_2 desorption peak at a temperature of 700°C or more.

9. Titanium dioxide fine particles according to any one of Claims 1 to 3, wherein doped carbon is desorbed as CO_2 by heating the titanium dioxide fine particles to show a CO_2 desorption peak at a temperature of 700°C or more.

10. Titanium dioxide fine particles according to any one of Claims 1 to 3, wherein a component having a m/e ratio between the mass number (m) and ionic charge number (e) of 68 is desorbed by heating the fine particles to show a desorption peak at a temperature of the component of 700°C or more.

11. Titanium dioxide fine particles, wherein two kinds or more of anions including at least nitrogen and carbon are doped in titanium dioxide.

12. Titanium dioxide fine particles according to Claim 11, wherein the content of the titanium dioxide component in the fine particles is 80% by weight or more.

13. Titanium dioxide fine particles according to Claim 11, wherein the concentration of doped nitrogen is 700 ppm by weight or more relative to titanium dioxide, and the concentration of doped carbon is 50 ppm by weight or more relative to titanium dioxide.

14. Titanium dioxide fine particles, wherein 700 ppm by weight or

more and 10,000 ppm by weight or less of nitrogen anions and carbon anions in a concentration of 1/30 or more and 1/3 or less of the concentration of nitrogen are doped in titanium dioxide.

15. The titanium dioxide fine particles according to any one of Claims 1 to 3, 11 and 14, wherein a particle diameter thereof is 1 μm or less.

16. The titanium dioxide fine particles according to any one of Claims 1 to 3, 11 and 14, wherein each particle has a ellipsoidal shape with a major axis length of 10 nm or more and 60 nm or less.

17. Titanium dioxide fine particles, wherein an IR spectrum measured by Fourier transform IR spectroscopy exhibits absorption peaks at 340 ± 10 cm^{-1} and 580 ± 50 cm^{-1}.

18. Titanium dioxide fine particles according to any one of Claims 1 to 3, 11, 14 and 17, wherein an isopropanol oxidation activity is exhibited under visible light irradiation with a wavelength of 400 nm or more and 600 nm or less.

19. Titanium dioxide fine particles according to any one of Claims 1 to 3, 11, 14 and 17,

wherein an acetone gas is formed in a concentration of 500 ppm or more using the titanium dioxide fine particles by the steps comprising: placing 0.2 g of the titanium dioxide fine particles as a sample formed into a uniform 10 cm square layer in a gas bag with a volume of 1 liter; filling an isopropanol gas in the bag by adjusting the initial concentration to 1,500 ppm ± 150 ppm; and irradiating a light from a UV-shielded fluorescent lamp to the

sample at an intensity of 0.5 W/cm^2 at an wavelength of 420 nm for 1 hour.

20. Titanium dioxide fine particles according to any one of Claims 1 to 3, 11, 14 and 17, used as a visible light activatable photocatalyst.

21. A method for producing titanium dioxide fine particles obtained by heat-treating a material of the titanium dioxide fine particles at 500°C or more and 620°C or less in a reducing gas atmosphere containing a nitrogen containing gas.

22. A method for producing titanium dioxide fine particles obtained by heat-treating a material of the titanium dioxide fine particles at 500°C or more and 620°C or less in an atmosphere of a nitrogen, carbon and hydrogen containing gas.

23. A method for producing titanium dioxide fine particles obtained by heat-treating a material of the titanium dioxide fine particles at 500°C or more and 620°C or less in an atmosphere of an NH_3 gas and carbon containing gas.

24. The method for producing titanium dioxide fine particles according to any one of Claims 21 to 23, wherein the material of the titanium dioxide fine particles has an average particle diameter of 10 nm or less and a specific surface area of 300 m^2/g or more.

25. A method for producing a visible light activatable photocatalyst obtained by heat-treating a molded body, a sintered

body or a film of titanium dioxide at 500°C or more and 620°C or less in a reducing gas atmosphere containing nitrogen gas.

26. A method for producing a visible light activatable photocatalyst obtained by heat-treating a molded body, a sintered body or a film of titanium dioxide at 500°C or more and 620°C or less in an atmosphere of a nitrogen, carbon and hydrogen containing gas.

27. A method for producing a visible light activatable photocatalyst obtained by heat-treating a molded body, a sintered body or a film of titanium dioxide at 500°C or more and 620°C or less in an atmosphere of an NH_3 gas and carbon containing gas.